scout

A Portfolio Impact Analysis Tool for Building Energy-Efficiency Technologies

Jared Langevin and Chioke Harris

EERE/AAAS Science and Technology Policy Fellows
Building Technologies Office, U.S. Department of Energy

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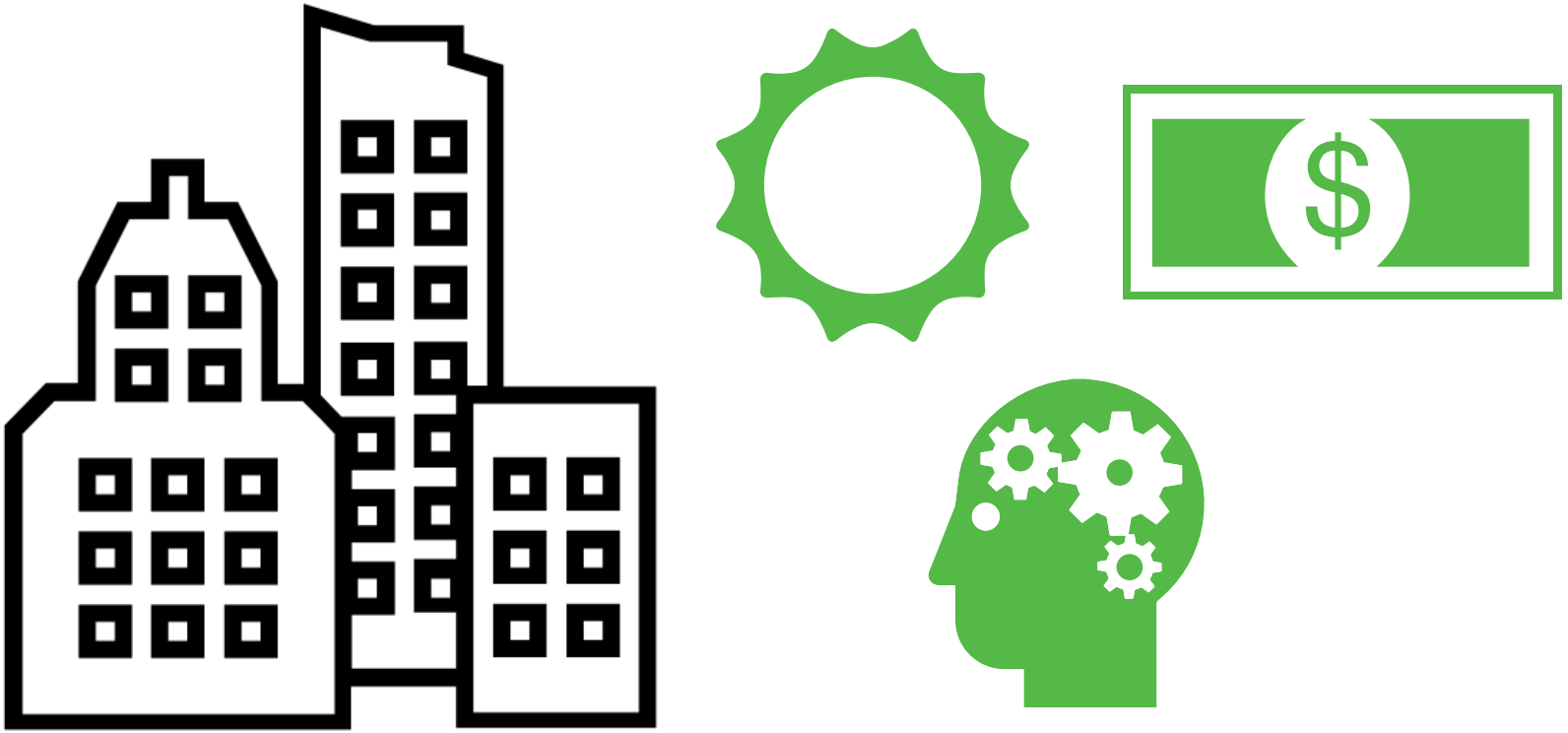
What we'll cover

1. New software for estimating national energy/CO_2 impacts of building energy efficiency measures

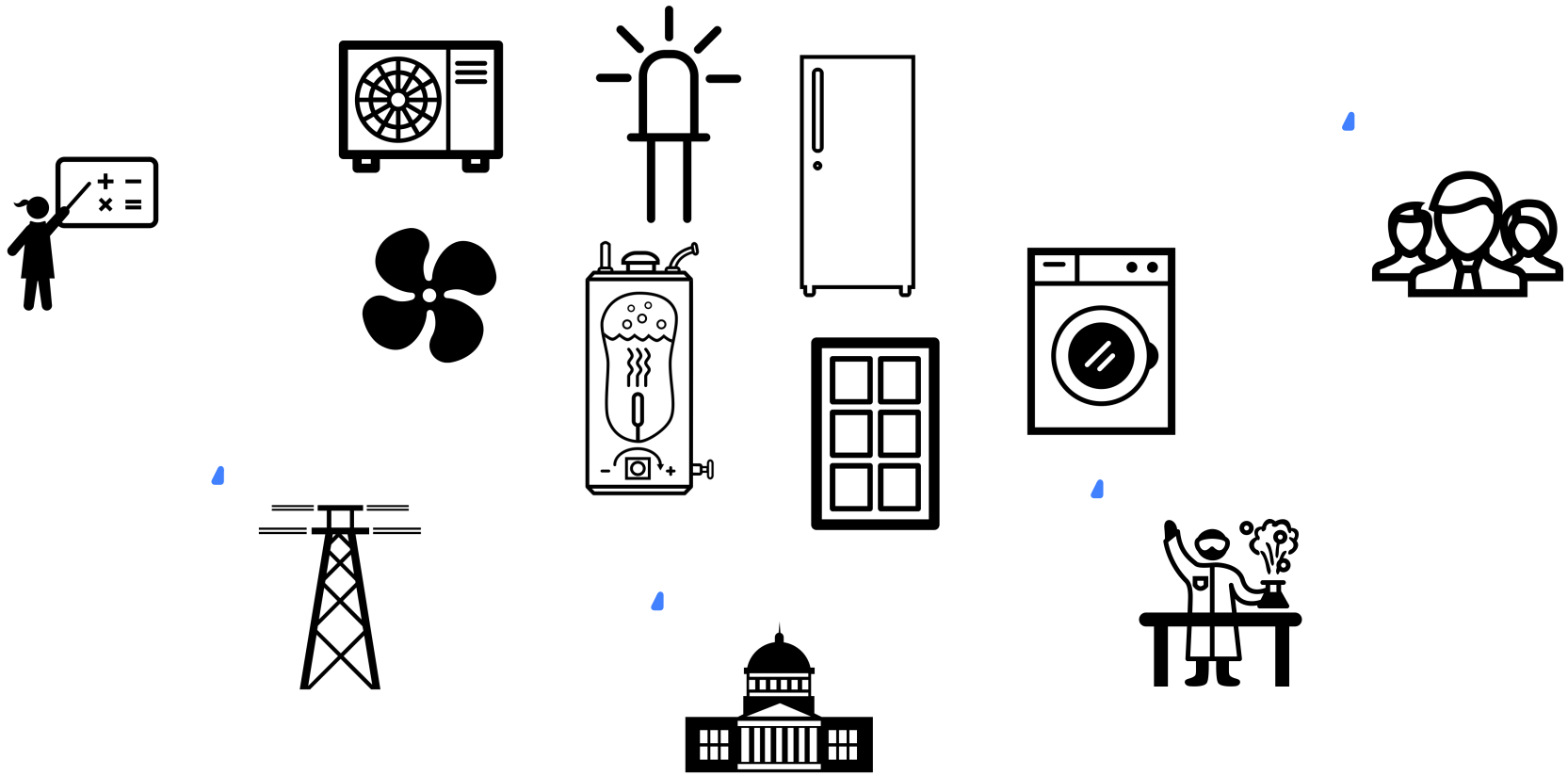
2. The data and modeling approach of this software

3. A vision for this software's use and development

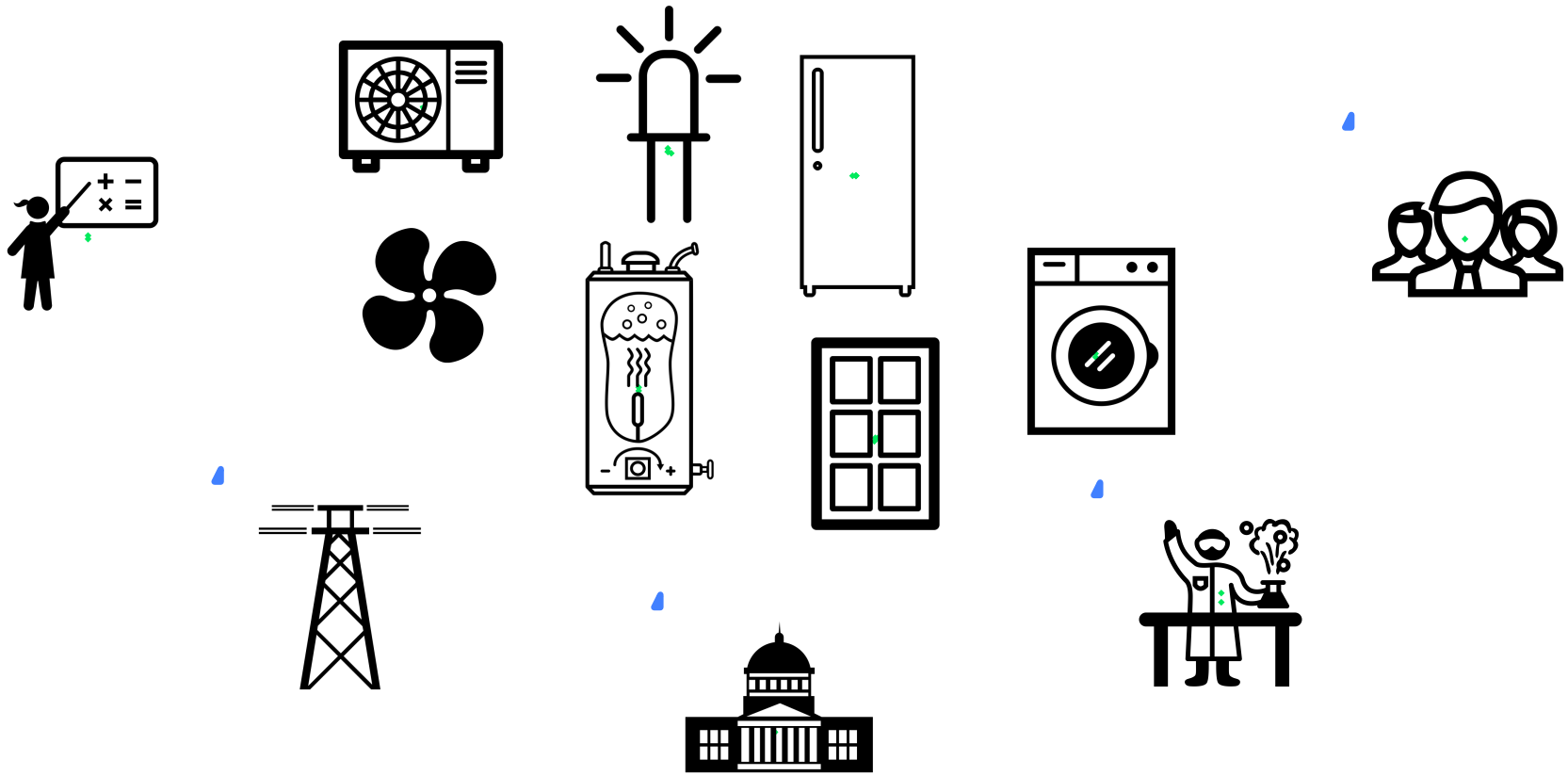
We all want low energy, low cost, healthy buildings



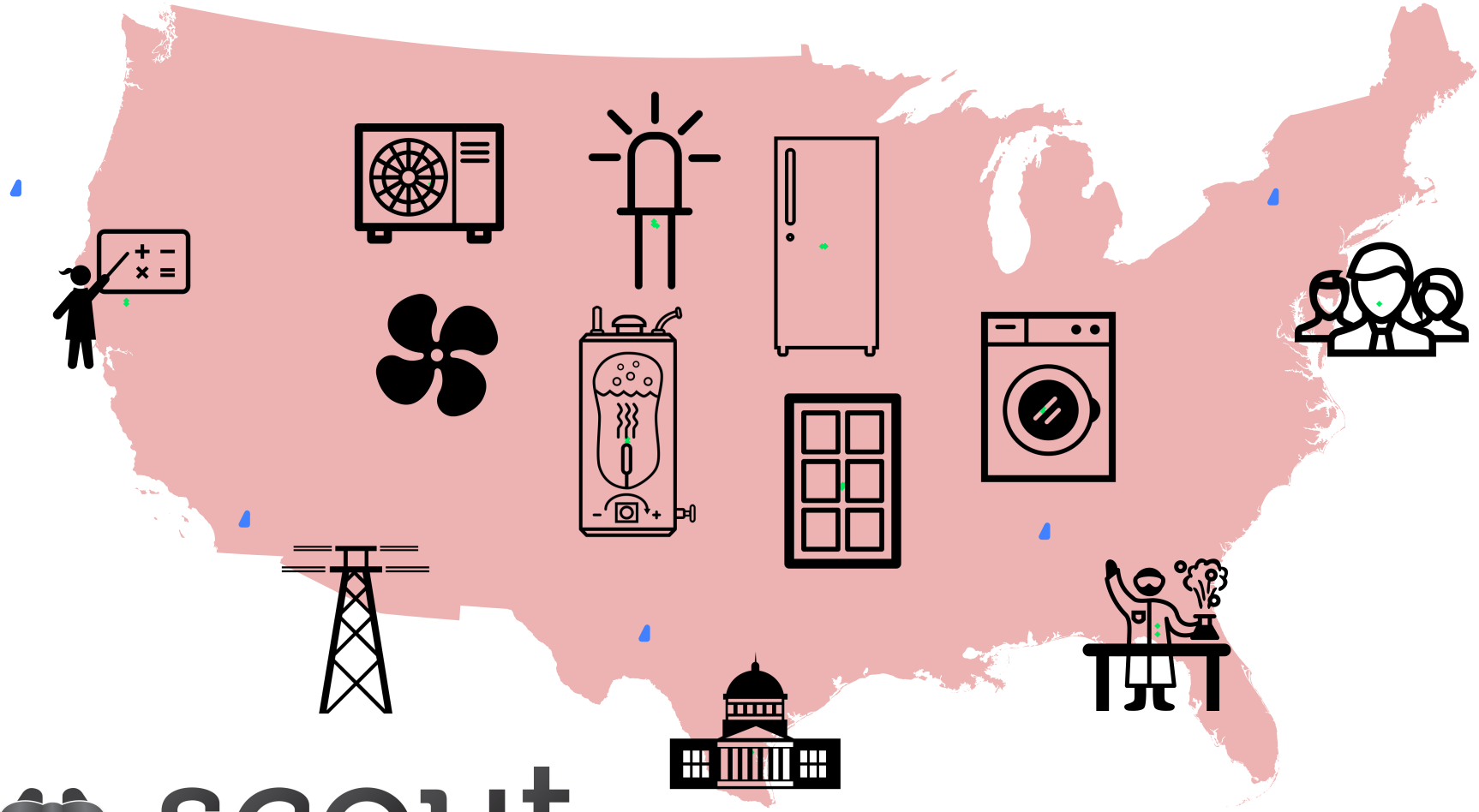
The problem: many efficient technologies, multiple perspectives



A level playing field is needed to assess efficiency impact potential



Scout establishes a common framework for impact estimation



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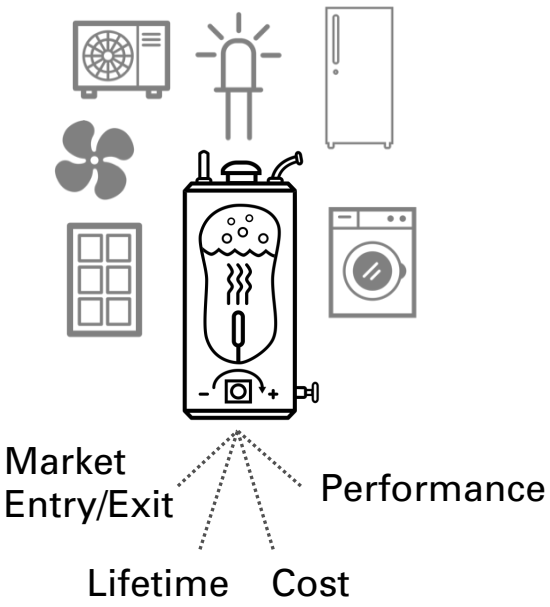
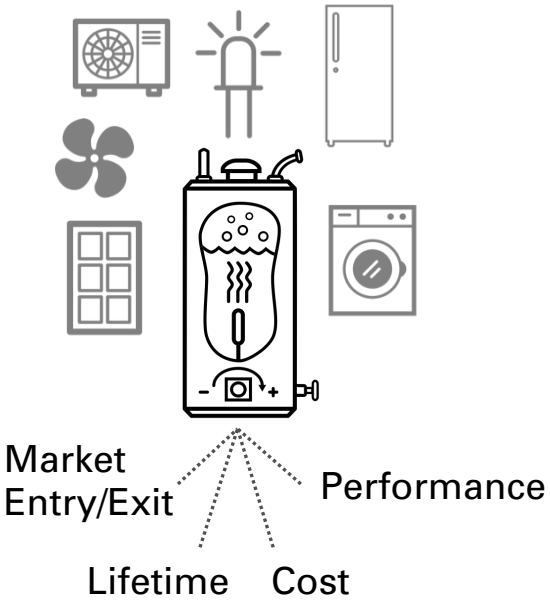
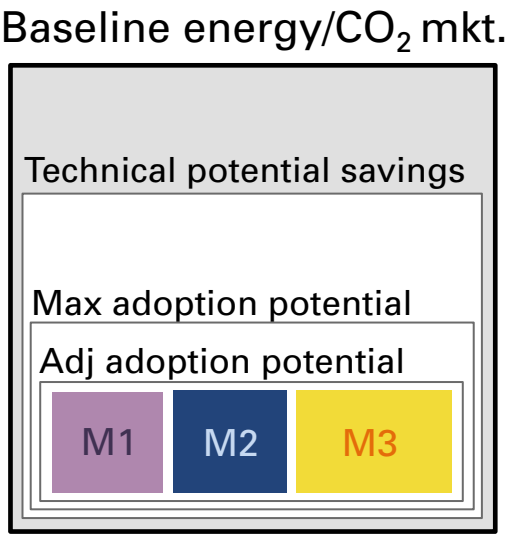
Scout scales individual efficiency measures across the U.S. stock



Define energy efficient measures

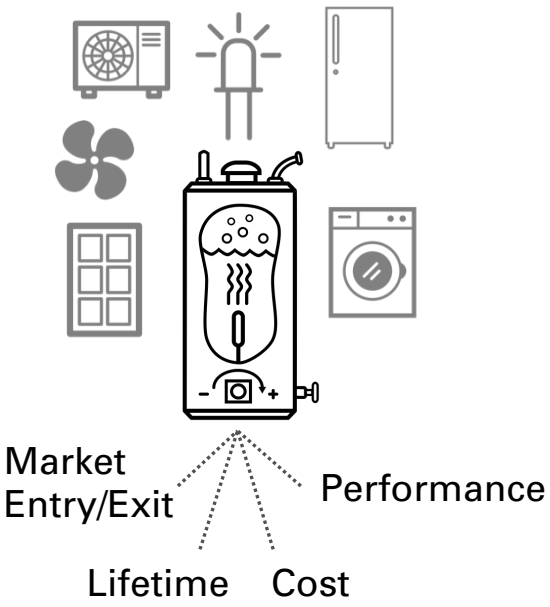
Scout scales individual efficiency measures across the U.S. stock

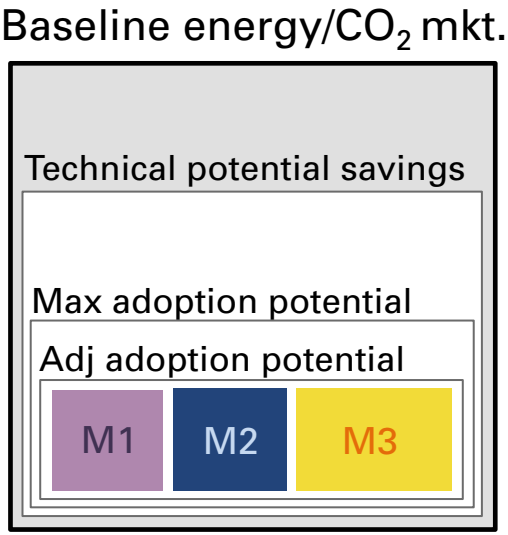




Define energy efficient measures → Apply measures to baseline energy and CO_2 markets under multiple adoption scenarios

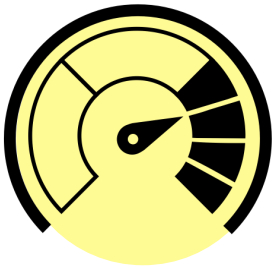
Scout scales individual efficiency measures across the U.S. stock





Define energy efficient measures → Apply measures to baseline energy and CO_2 markets under multiple adoption scenarios → Output national energy/ CO_2 reductions and their cost-effectiveness

Scout measures are defined by performance, cost, and lifetime



Performance

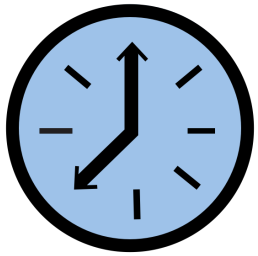
Definition: Per unit absolute (e.g., COP) or relative (e.g., savings %)

Sources: EnergyPlus, publications

Cost

Definition: Per unit installed cost

Sources: Product literature, public databases (e.g., ENERGY STAR), EIA

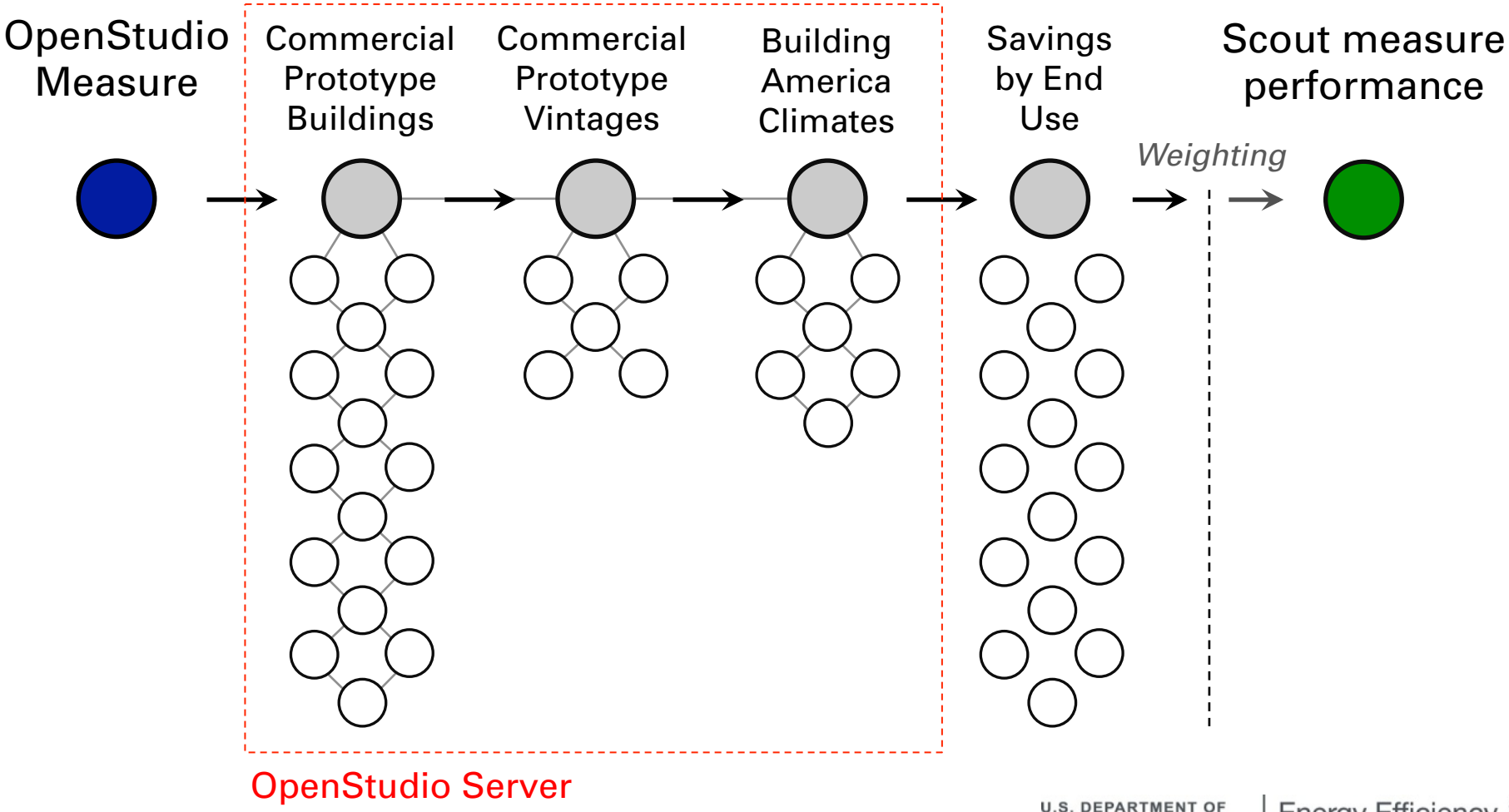


Lifetime

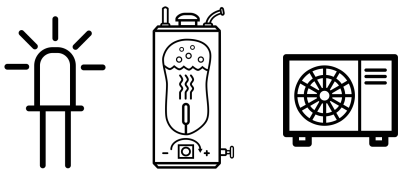
Definition: Useful unit life in years

Sources: Product literature, public databases, EIA

Measure performance can be defined via EnergyPlus/OpenStudio



Measures can be packaged and assigned input uncertainty



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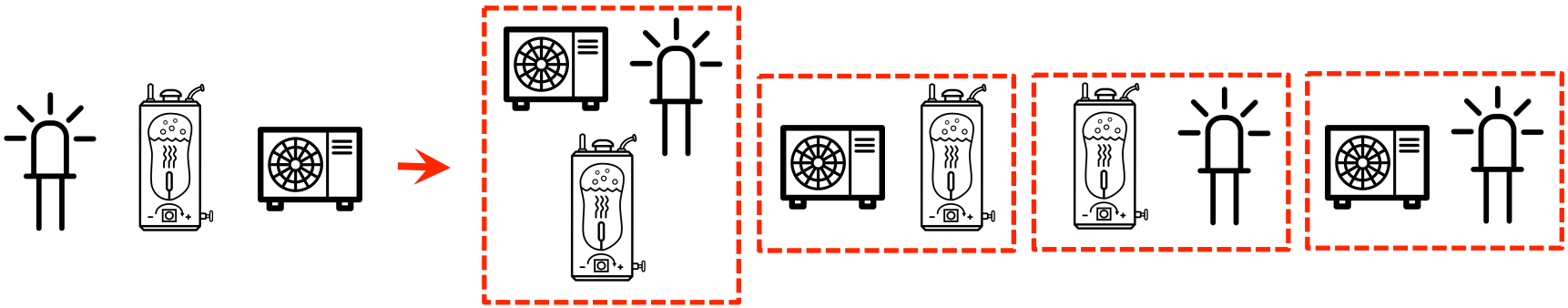

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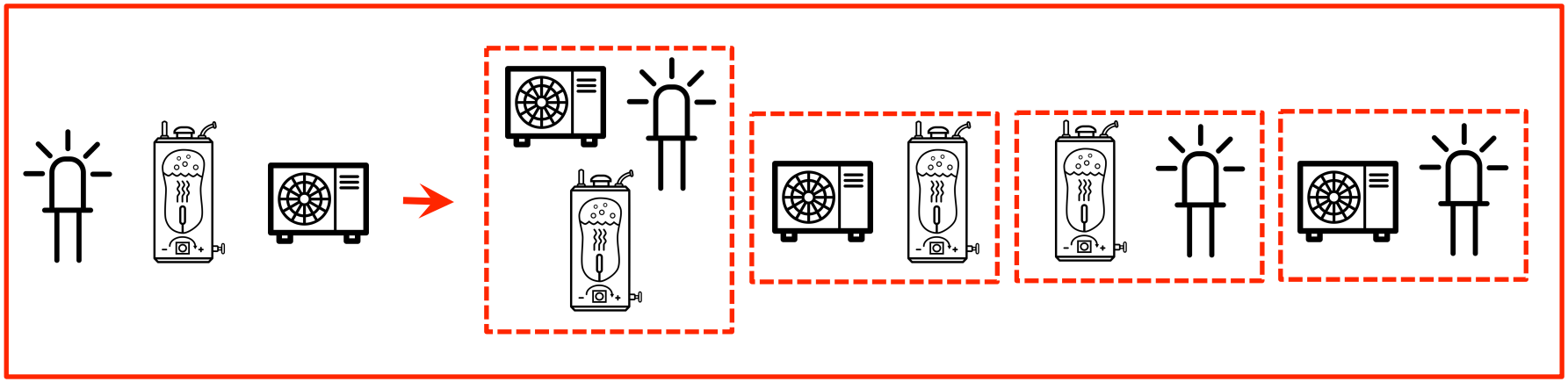

Compete individual and packaged measures

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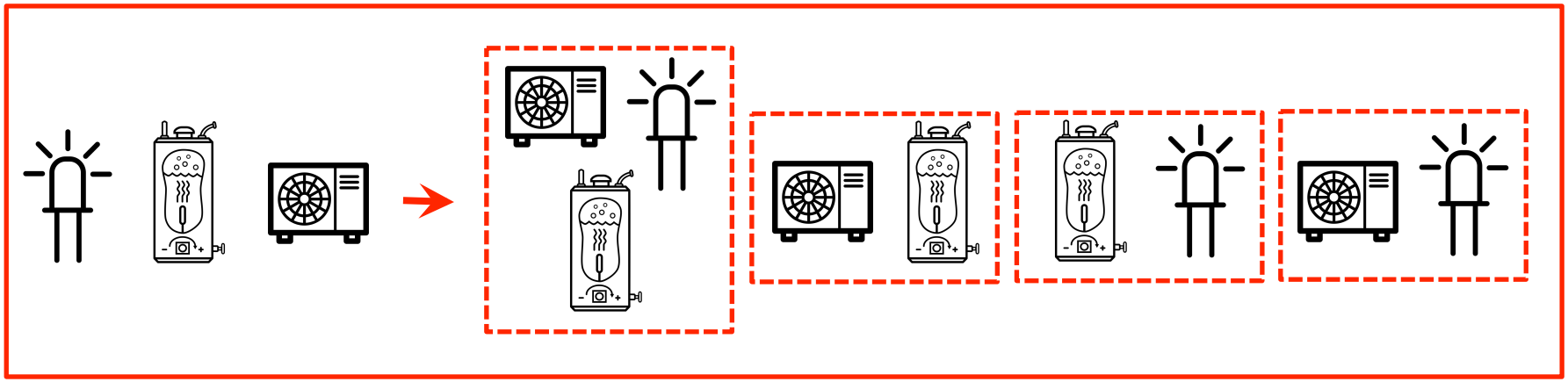

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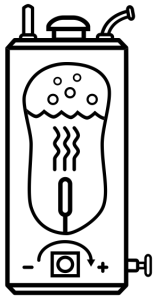
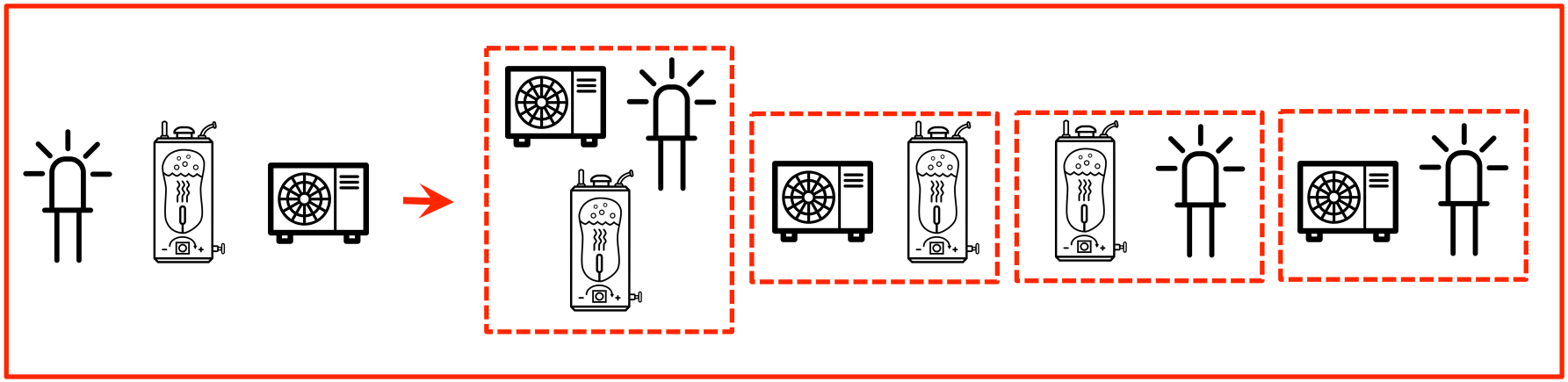


Cost: $1850

Performance: 2 EF

Lifetime: 13 years

Measures can be packaged and assigned input uncertainty



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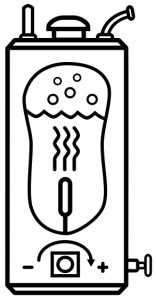

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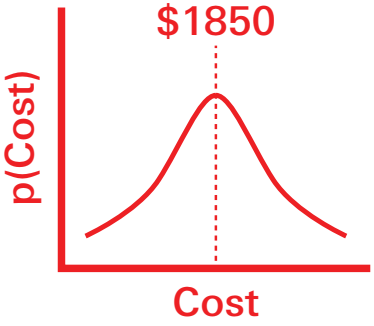

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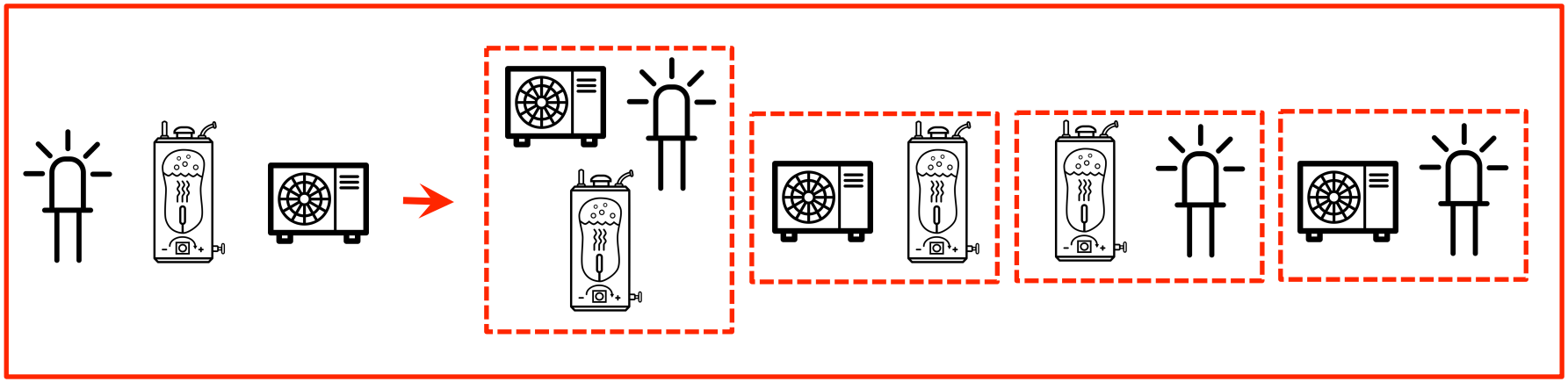

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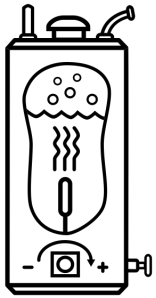

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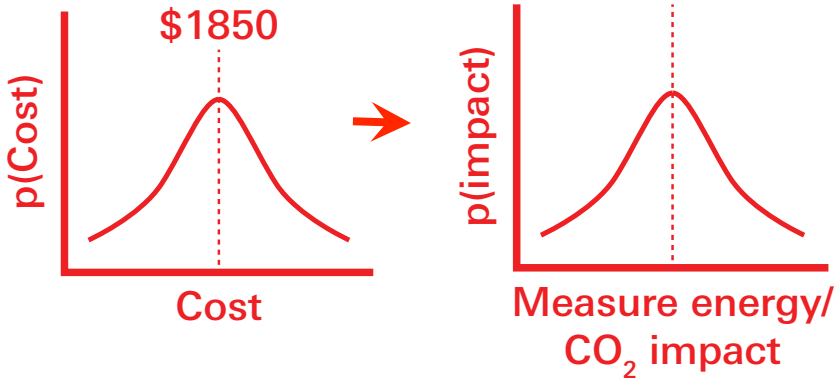
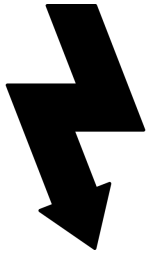


Measures apply to baselines drawn from EIA Annual Energy Outlook

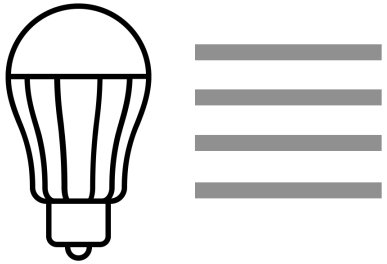
Data reported for each year from 2009 to 2040

Energy Use

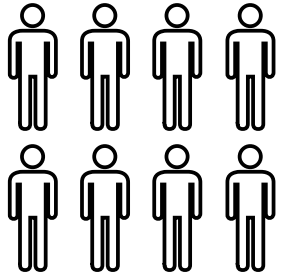


Building Stock

Equipment Characteristics



Adoption Model Parameters



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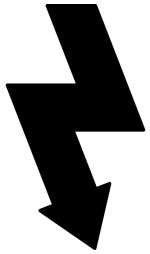

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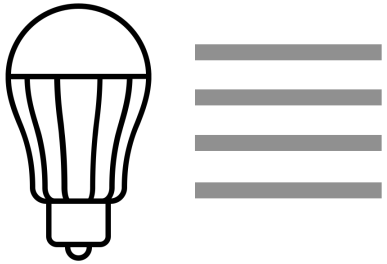

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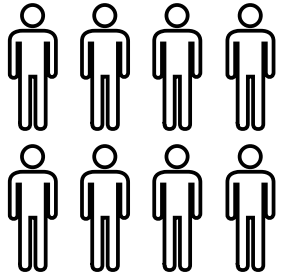
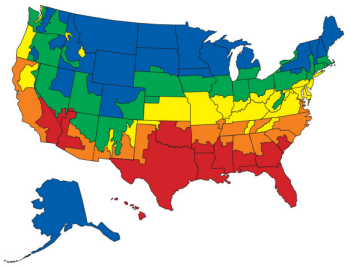
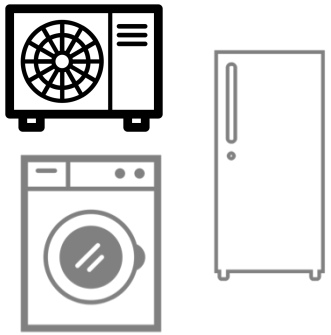


Building Type

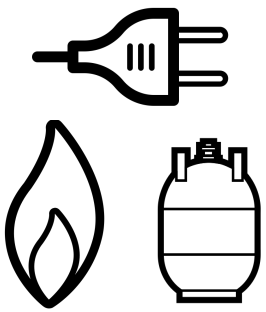
Climate Zone



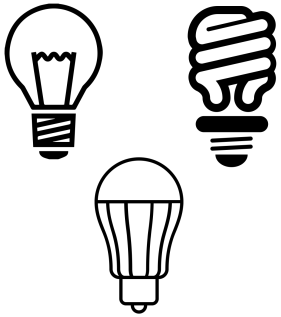
End Use



Fuel Type



Technology



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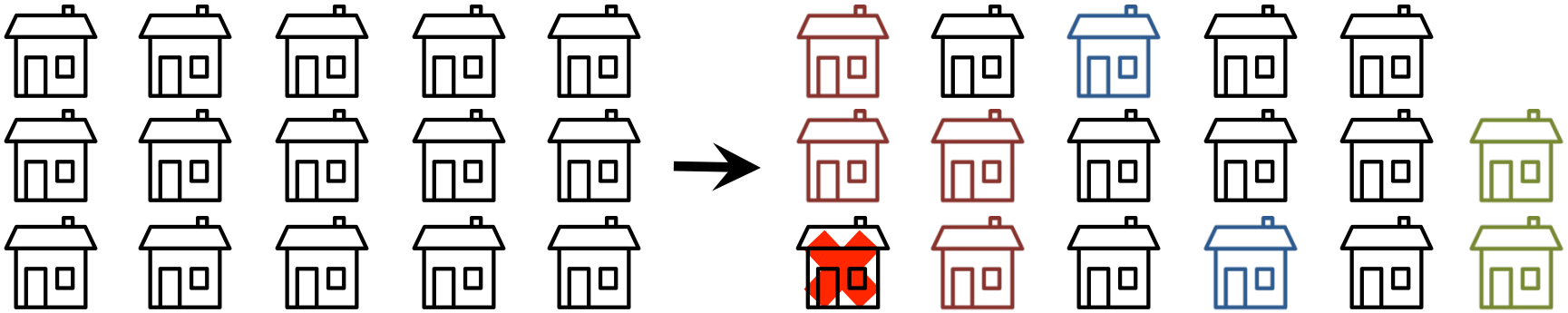
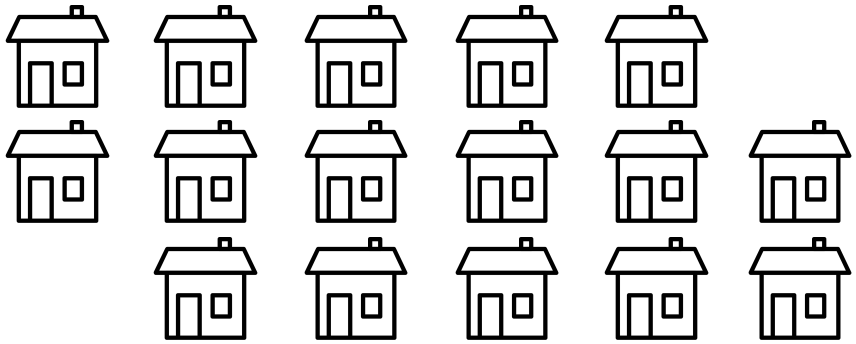
Baseline data define building and equipment stocks and flows

Year Y



Year Y+1



Existing stock

Replacement

Retrofit (elective replacement)

New

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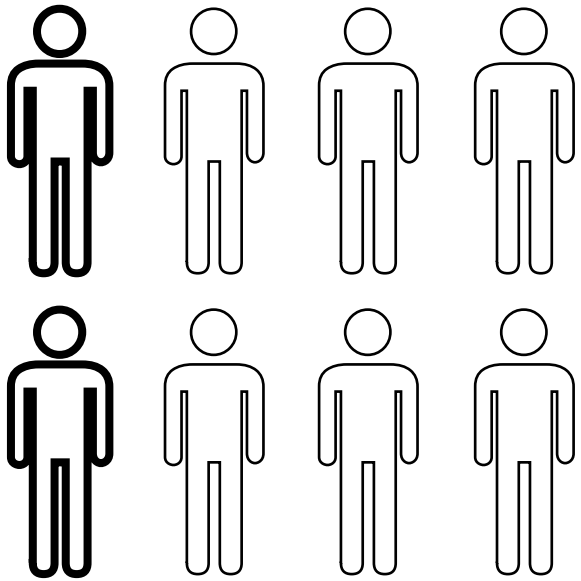
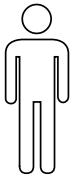
Measures diffuse into markets under three adoption scenarios

Total baseline market (Year Y)



New/replace/ retrofit baseline ('Competed')



Uncompeted baseline

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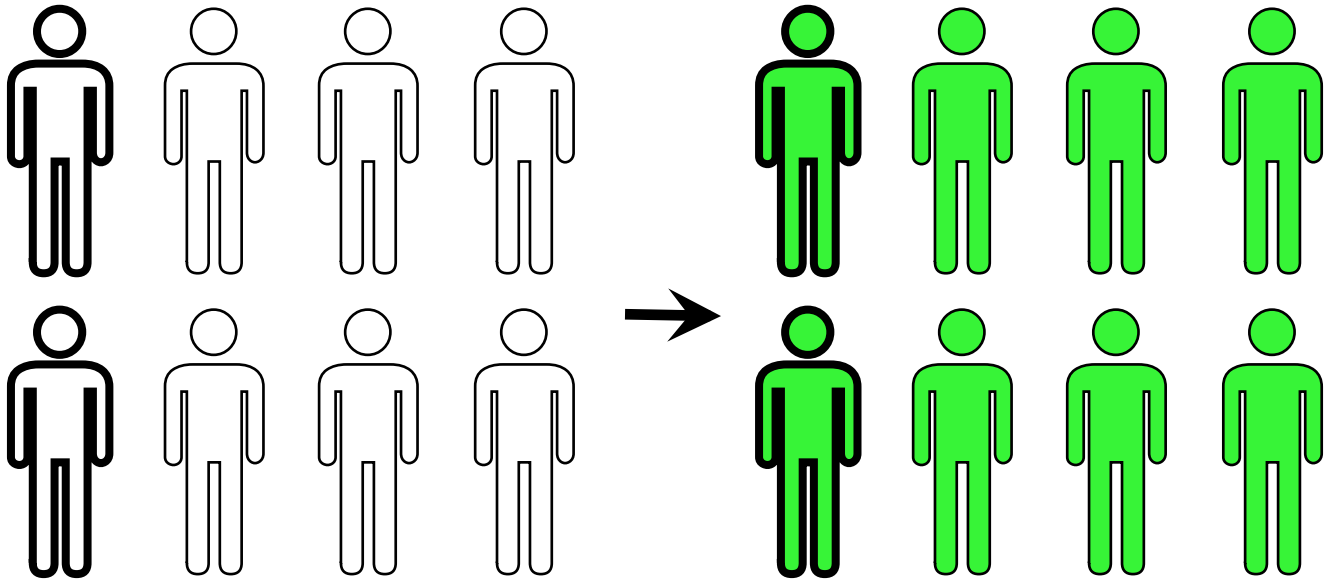
Measures diffuse into markets under three adoption scenarios

Technical Potential Scenario: Total market fully captured



New/replace/ retrofit baseline ('Competed')

Uncompeted baseline

Captured by an efficient measure

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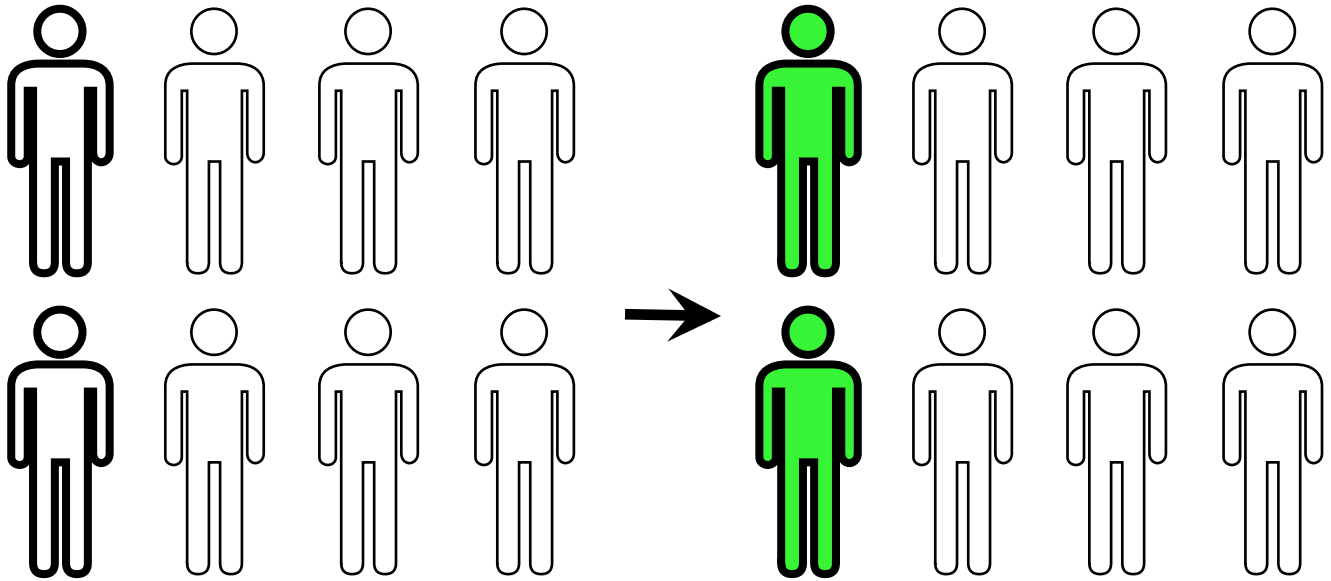
Measures diffuse into markets under three adoption scenarios

Max Adoption Scenario: Competed market fully captured



New/replace/ retrofit baseline ('Competed')

Uncompeted baseline

Captured by an efficient measure

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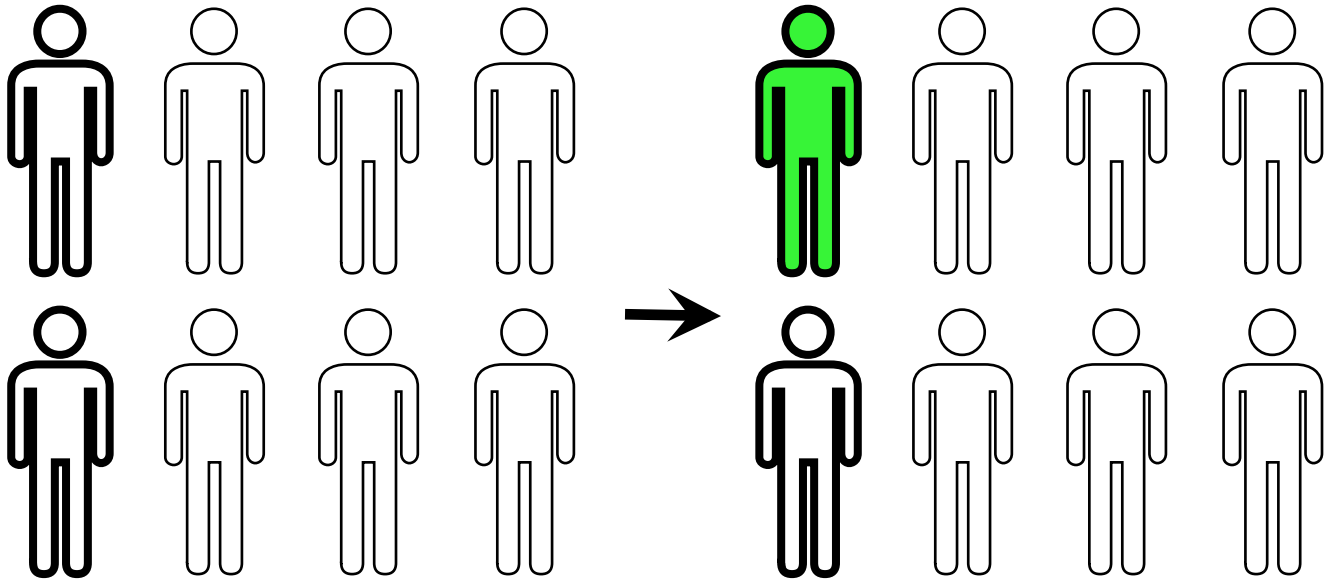
Measures diffuse into markets under three adoption scenarios

Adjusted Adoption Scenario: Competed market partially captured



New/replace/ retrofit baseline ('Competed')

Uncompeted baseline

Captured by an efficient measure

* Not currently implemented

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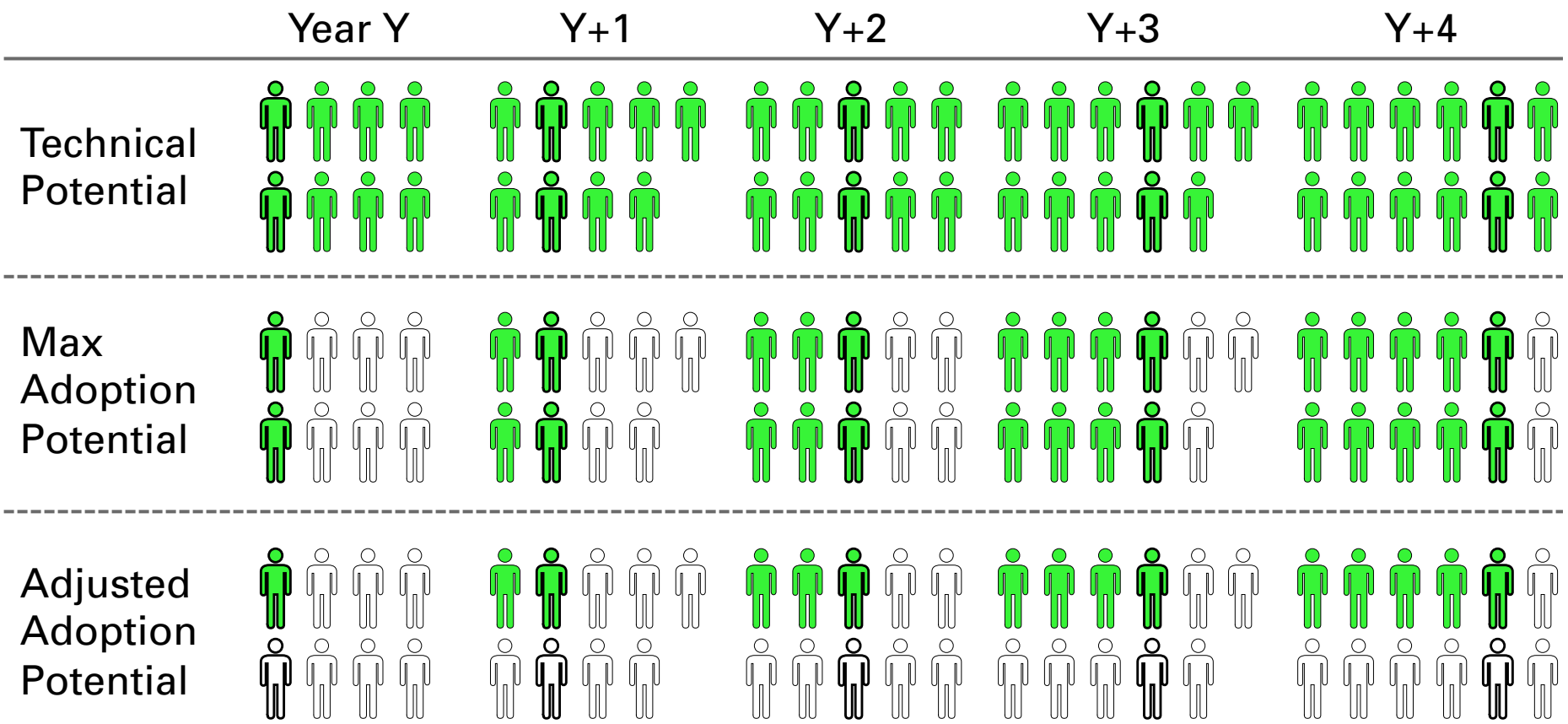
Adoption scenarios determine measure diffusion rates over time



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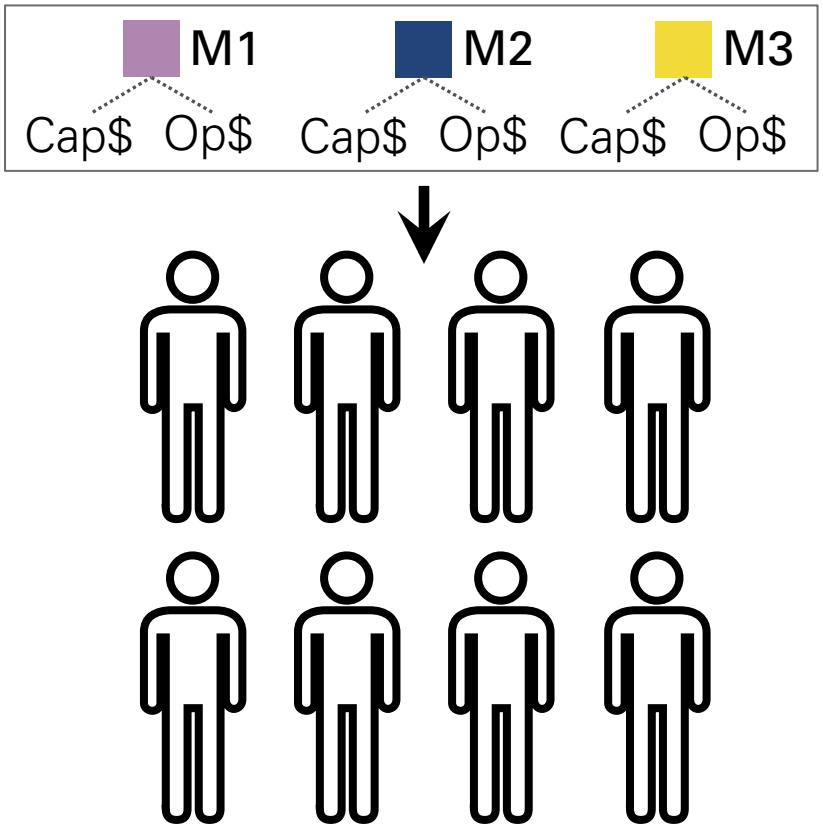
Competing measures are attributed shares of their baseline markets



Competed baseline

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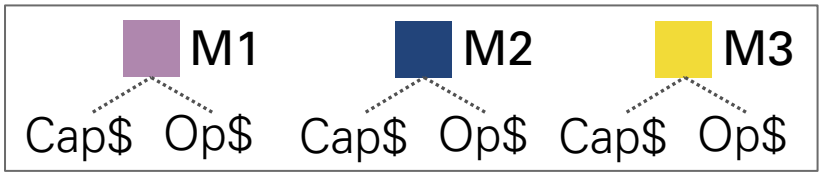
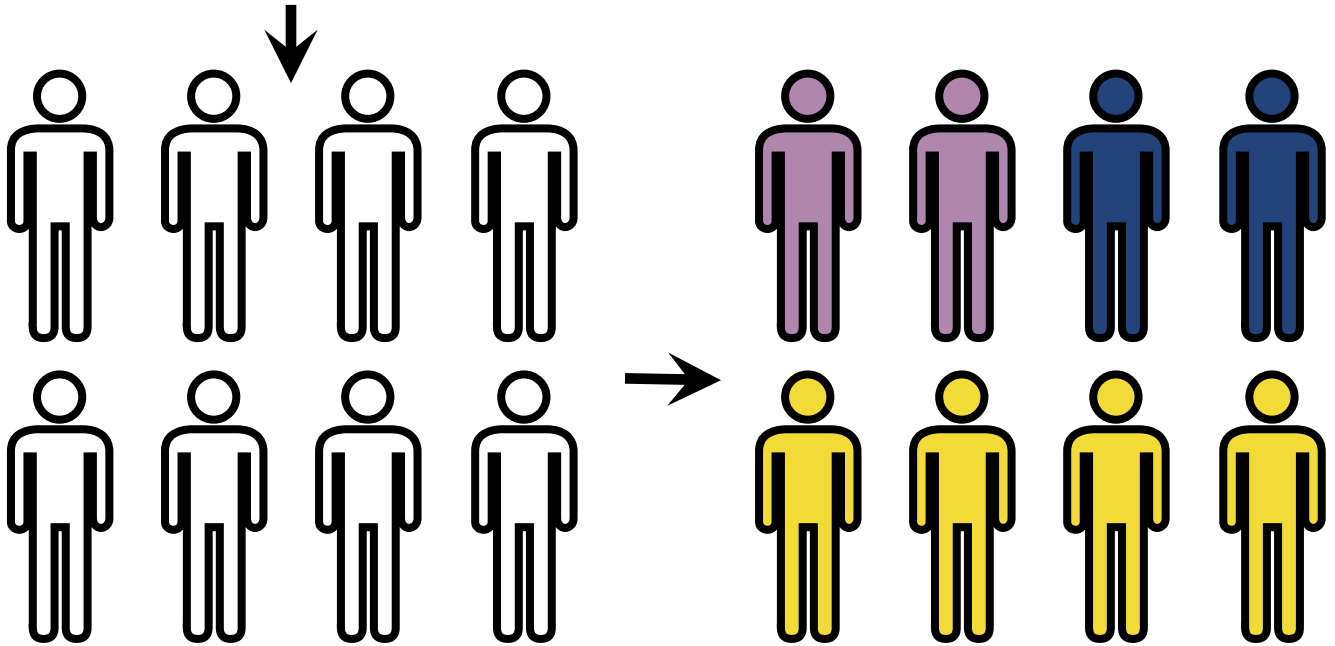


Measure market shares determined by per unit capital/operating costs
*(based on NEMS adoption models)




Competed baseline


Captured (M1)


Captured (M2)

Captured (M3)

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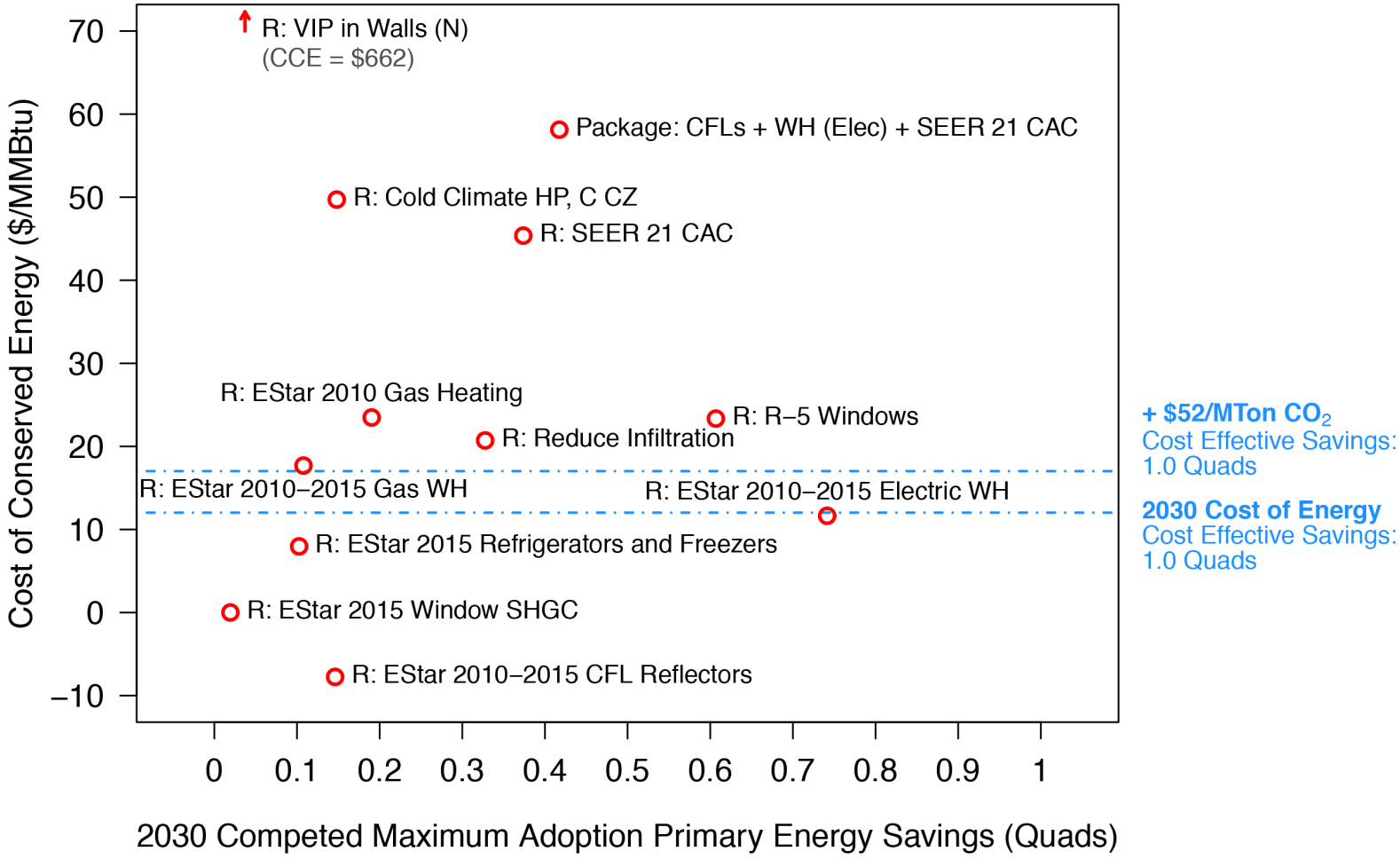
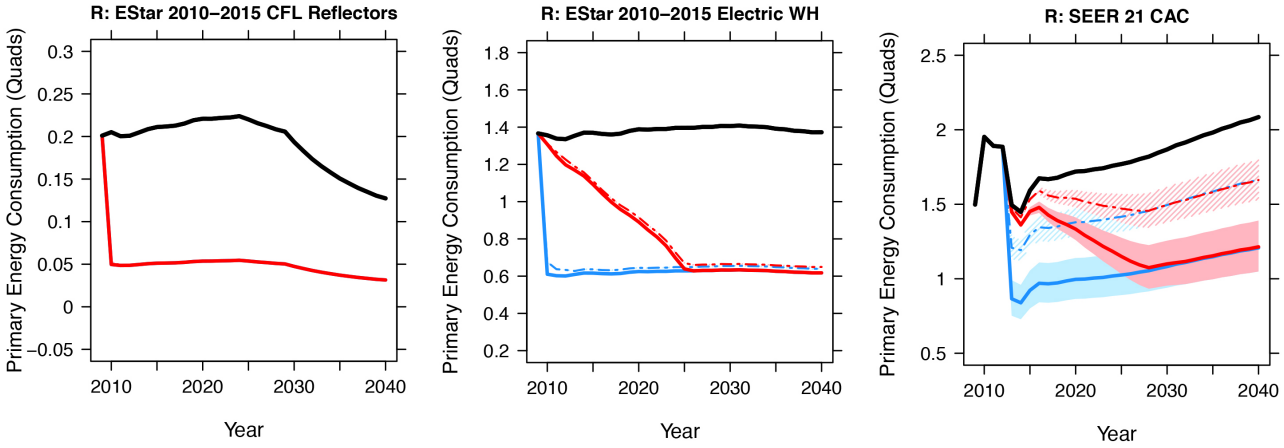
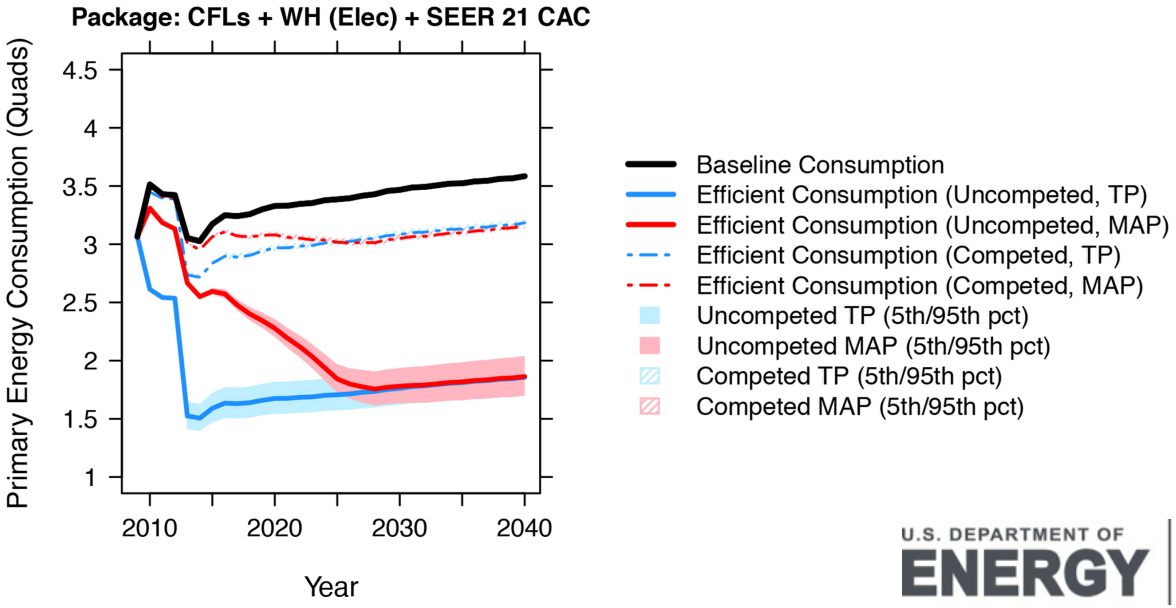
Measures are evaluated by savings impacts and cost-effectiveness

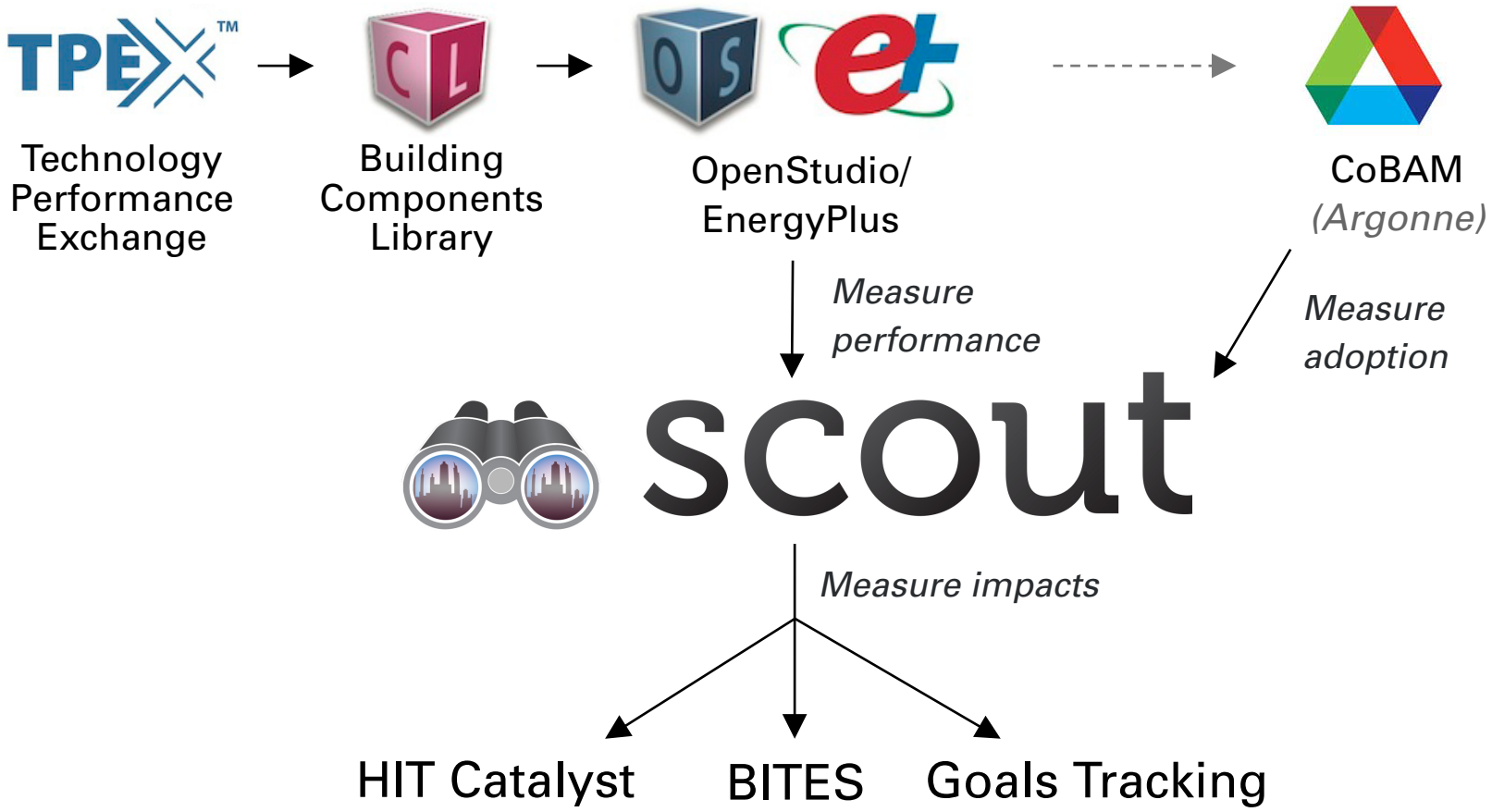


Results can show the effect of package measures, uncertainty





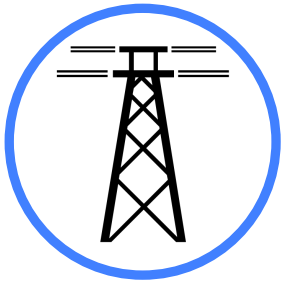
Scout fits into a larger BTO analysis ecosystem



Scout is also relevant to the analysis needs of non-BTO parties

Academics, national labs, and **industry partners** can use Scout to communicate the larger-scale benefits of R&D breakthroughs

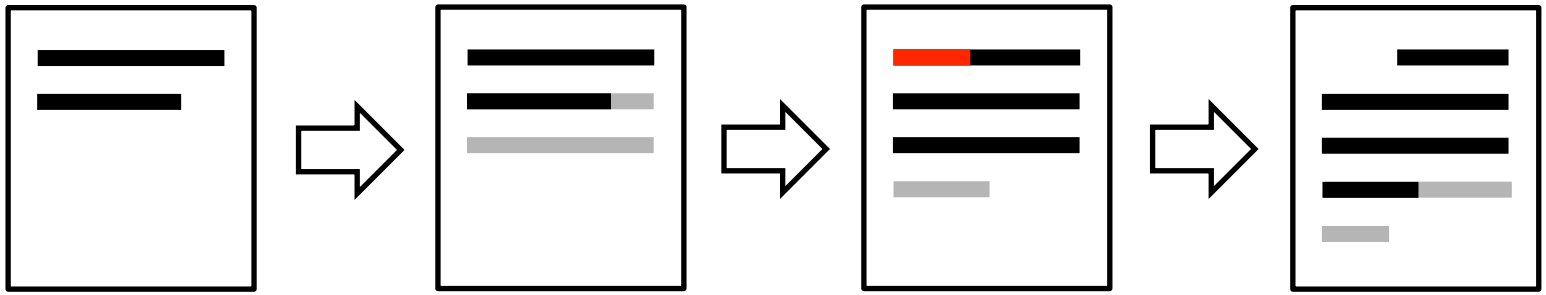
Other federal agencies can use Scout to estimate the potential impacts of funding in achieving energy and CO_2 reduction goals



Utilities can use Scout to develop 'deemed savings' values and corresponding incentives for Energy Conservation Measures

Scout is flexible to future development and expansion

Version control



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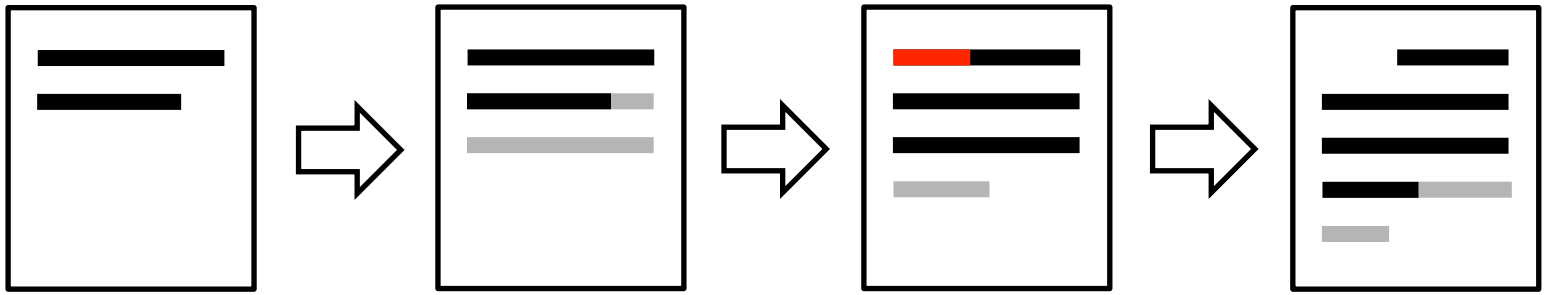
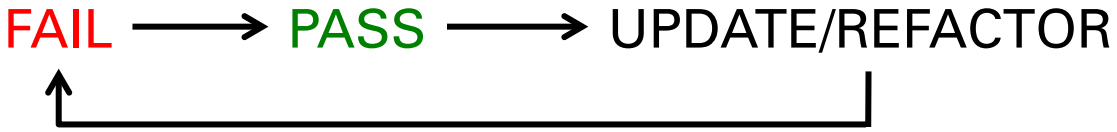
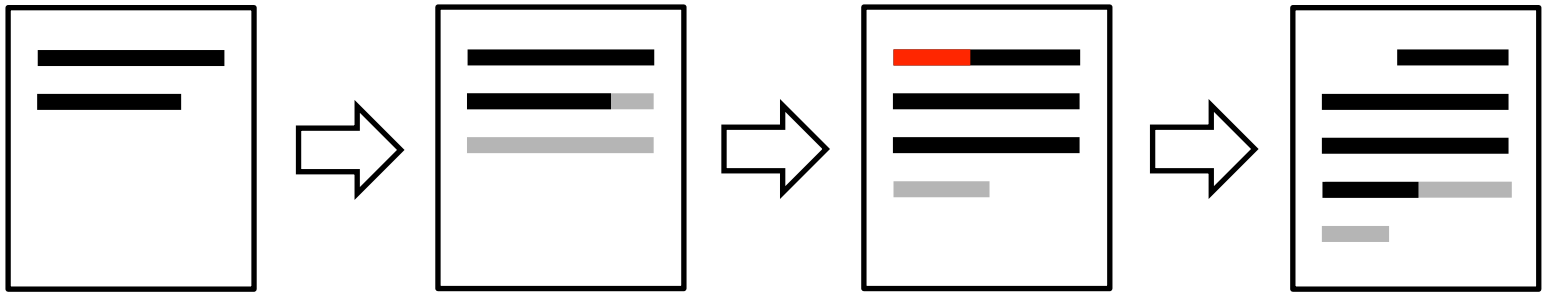


Test-driven development



Scout is flexible to future development and expansion

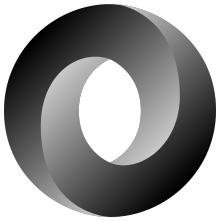
Version control



Test-driven development

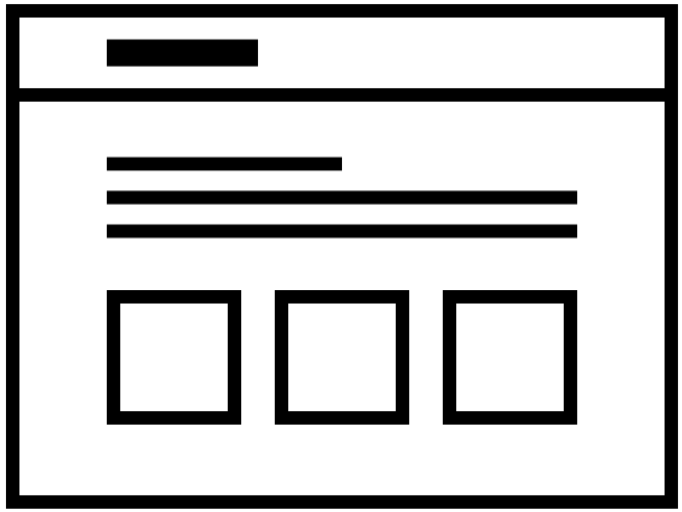
FAIL → PASS → UPDATE/REFACTOR

Widely adopted open-source tools and methods

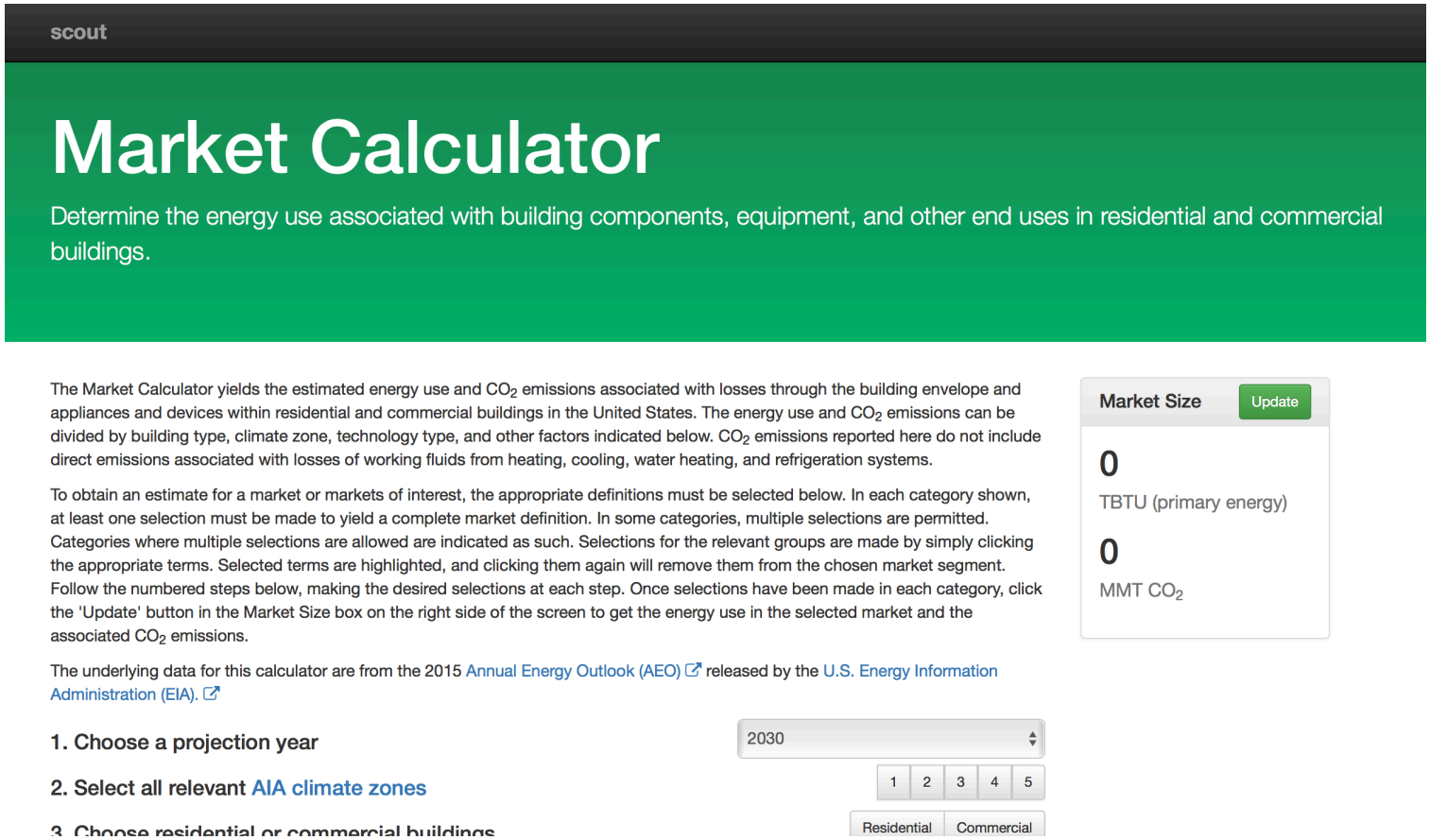


BTO plans to develop a web interface for Scout to encourage wider use

- Review existing measures
- Submit new measures
- Suggest measure revisions
- Review model assumptions
- Visualize existing results
- Access model documentation



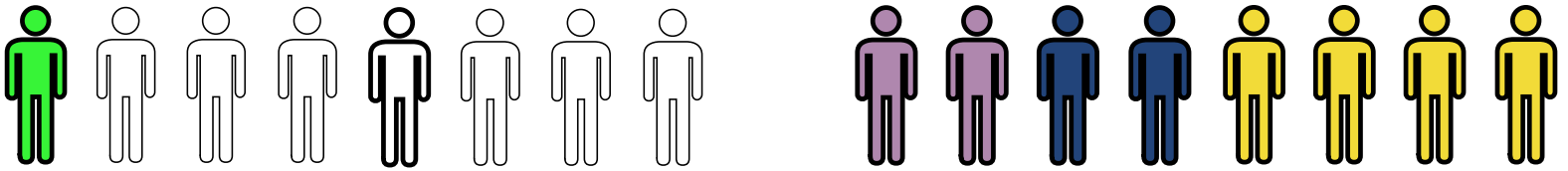
Using Scout input data, Market Calculator is available now



https://trynthink.github.io/scout/calculator.html

Multiple areas have been identified for future model updates

Improved representation of consumer adoption dynamics



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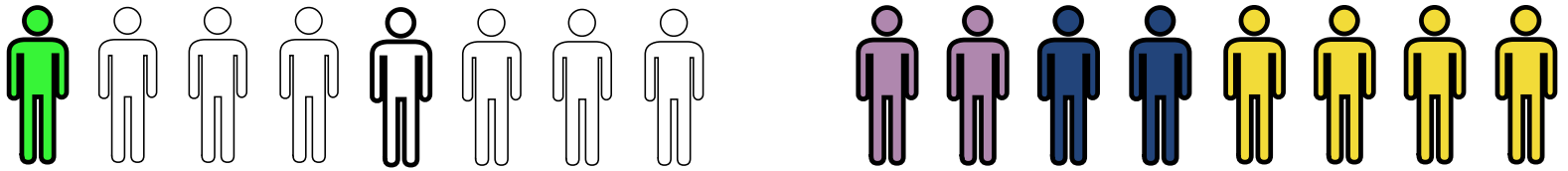
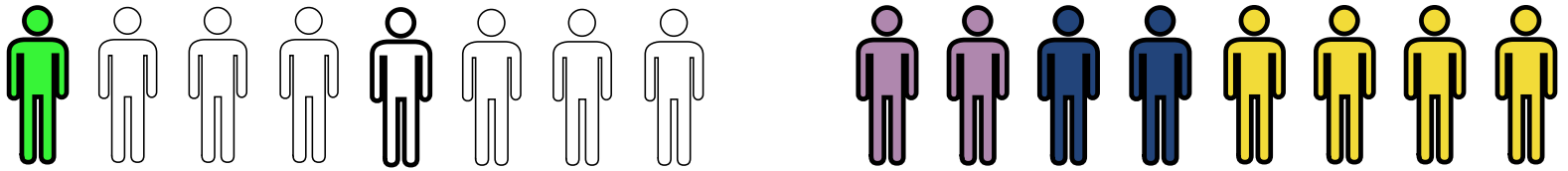


Modeling potential for peak demand reductions

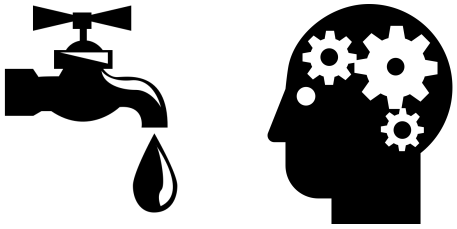
Multiple areas have been identified for future model updates

Improved representation of consumer adoption dynamics



Modeling potential for peak demand reductions

Non-energy benefits



Chioke Harris
chioke.harris@ee.doe.gov

Jared Langevin
jared.langevin@ee.doe.gov

Icon attributions

Slide 3: buildings (Milky-Digital Innovation); US dollar (Christopher Beach); lightning bolt (Tristan)

Slide 4: LED (Nikita Kozin); water heater (Michael Thompson); air conditioning unit (Arthur Shlain); fan (Edward Boatman); refrigerator (shashank singh); washing machine (Ed Harrison); window (Arthur Shlain); teacher (TukTuk Design); utility tower (Maurizio Fusillo); Capitol building (Kelcey Hurst); lab scientist (Edward Boatman); business team (lastpark)

Slide 6: United States (Bohdan Burmich)

Slide 9: energy dollar (Nicholas Menghini); power plant (Francesca Ameglio)

Slide 10: gauge (Nicolas Vicent); clock (Nadya Bratt)

Slide 18: energy (Edward Boatman); buildings, mosque, house (Creative Stall); school (Tran)

Slide 19: plug (Arthur Shlain); flame (Samuel Q. Green); propane tank (Carlos Salgado); fluorescent light bulb (Matt Brooks); light bulb (Marco Galtarossa); LED bulb (Alex Podolsky)

Slide 26: figure (Alexander Smith)

Slide 35: homepage (Lil Squid)

Slide 38: solar panels (Adam Terpening); turbines (Creative Stall); power plant (Iconathon); clock (Karen Tyler)

Slide 39: faucet (Carla Gom Mejorada)

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